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ABSTRACT

A study investigated how Hispanic bilingual students' knowledge of Spanish vocabulary and awareness of Spanish-English cognates influence comprehension of English expository text. The subjects, 74 upper elementary school students literate in both Spanish and English, were tested for vocabulary knowledge in both languages. After reading four expository texts containing English words with Spanish cognates (e.g., English "transform" and Spanish "transformar"), subjects were given a multiple-choice test for understanding of key concepts from the texts. After a brief explanation of the concept of cognates, they were asked to identify words in the text with Spanish cognates. Results indicate the following: (1) the students were aware of cognates and made some use of that knowledge in their English reading; (2) the contribution of Spanish vocabulary knowledge to English reading is not automatic, but depends on the degree of awareness of the languages' cognate relationship; and (3) student knowledge of cognates could be even greater, suggesting that explicit instruction in cognates may be useful. Further research on the nature of student understanding of cognates is recommended. Appended materials include a sample multiple-choice test item, statistical results of the study, a sample passage and related questions, a list of target cognates, and the cognate-circling task. (MSE)

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Center for the Study of Reading

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Abstract

A study was conducted to determine how Hispanic bilingual students' knowledge of Spanish vocabulary and awareness of Spanish-English cognates influence their comprehension of English expository text. Subjects, 74 upper elementary Hispanic students able to read in both Spanish and English, were tested for Spanish and English vocabulary knowledge, and after reading each of four expository texts containing English words with Spanish cognates (e.g., English *transform* and Spanish *transformar*) were given a multiple-choice test on their understanding of key concepts from these texts. After a brief explanation of the concept *cognate*, they were asked to identify the words in these texts that had Spanish cognates. Performance on the multiple-choice test was found to be influenced by students' awareness of cognate relationships. The effects of Spanish vocabulary knowledge on English reading comprehension also appeared to be mediated by awareness of cognates.

CROSS-LANGUAGE TRANSFER OF LEXICAL KNOWLEDGE: BILINGUAL STUDENTS' USE OF COGNATES

Research in first-language reading has repeatedly documented a strong correlational relationship between students' vocabulary knowledge and their ability to comprehend text (Anderson & Freebody, 1981). The causal relationships underlying this correlation are not simple. They involve not just the students' knowledge of specific words, but also their knowledge of the concepts referred to by the words, the depth and fluency of their knowledge of the words, and the extent to which they have been able to acquire words through extensive exposure to written language (Anderson & Freebody, 1981; Mezynski, 1983). Nevertheless, it is clear that vocabulary plays a crucial role in first-language reading.

Research in second-language reading has tended to focus more on morphology and syntax than on vocabulary (see Weber, 1991). However, there is some evidence that the reading difficulties of limited-English-proficient children in the United States may be related more directly to vocabulary than to these other two factors (see García, 1988, 1991; Saville-Troike, 1984). Moreover, data from the National Assessment of Educational Progress reading report card (Applebee, Langer, & Mullis, 1987) suggest that differences in the reading performance of Hispanic and Anglo (non-Hispanic white) students begin to increase around fourth grade and continue even through college. These differences appear to be primarily in the areas of vocabulary and conceptual knowledge rather than in the mechanics of reading (Chall, 1983). They may be due to the rapidly increasing vocabulary load students experience in their reading beginning in fourth grade, and to the fact that students are expected to gain both vocabulary and content knowledge from text.

One of the underlying assumptions in bilingual education is that students who are literate in their first language can transfer some of their knowledge and skills in first-language reading to second-language reading (see Grabe, 1988). There is some empirical evidence for this claim (see Hudelson, 1981; Langer, Bartolomé, Vasquez, & Lucas, 1990). For example, we know that students' reading performance in their first language tends to correlate with that in their second language (Tregar & Wong, 1984), and that proficient readers in both languages, as compared to less proficient readers, are better at using "meaning making" strategies in the two languages (Langer et al., 1990). However, we do not know much about the specific types of knowledge and strategies that transfer, nor do we know the conditions under which such transference might occur.

The purpose of our study was to examine the extent to which bilingual Hispanic students in the upper elementary grades in the United States are able to transfer vocabulary knowledge in their first language to reading in their second language through the use of cognates. Many words in English, especially in academic and technical English, have close Spanish cognates--that is, Spanish words with obvious orthographic similarity and closely related meanings. In many cases, words in the two languages are almost identical both in spelling and meaning (e.g., *vision*, *personal*, *fundamental*). Often there are only minor, predictable changes in spelling (e.g., *dialect/dialecto*, *pharmacy/farmácia*, *emotion/emoción*). Because much of English academic vocabulary is derived from Latin, many words that are academic or rare words in English have cognates that are relatively common words in Spanish. For example, *infirm* is an infrequent word in English, whereas its cognate *enfermo* is the everyday word for *sick* in Spanish. If Hispanic bilingual students know the Spanish words, and recognize the cognate relationships, their Spanish knowledge should provide them with substantial help in English vocabulary, especially difficult reading vocabulary.

Research with bilingual students who are expert readers in English suggests that such students do make use of their knowledge of cognate relationships (Jiménez, 1992; Jiménez, García, & Pearson, in

preparation). On the other hand, there is some anecdotal evidence (cf. García, 1988) that upper elementary Hispanic bilingual students sometimes overlook even obvious parallels between Spanish and English, and hence do not fully utilize the potential help offered by cognates.

The specific objectives of the current study are twofold: First, we want to determine whether there is transfer of lexical knowledge from students' first language to reading in a second language--that is, are students able to apply their knowledge of words and concepts in Spanish when reading English text? Second, we want to know the extent to which this transfer of lexical knowledge is mediated by awareness of cognate relationships between English and Spanish.

METHOD

Subjects

Subjects were 74 Spanish-English bilingual, biliterate students from two predominantly Hispanic urban elementary schools (K-8). Twenty-nine fourth graders, 33 fifth graders, and 12 sixth graders participated in the study. The subjects were drawn from a pool of 107 students who were identified by their school principals as Spanish-English bilinguals on the basis of school records, assessment data, and personal knowledge. Only those students who were able to understand instructions in spoken and written English, to complete the English and Spanish vocabulary tests, and to read the passages in English were included in the analyses. Students who were unable to complete the tasks in either language, as well as those students who were absent from any of the experimental sessions, were dropped from the study.

On a questionnaire used to gather background information, all subjects in the study reported that they spoke Spanish and were able to read in both Spanish and English. About half (53.6%) reported that they could read better in Spanish than in English. Two thirds reported having been in a bilingual education program, and one third said they had attended school outside of the United States.

The students at one of the schools (all of the fourth graders and over half of the fifth graders in the study) were enrolled in bilingual education classrooms. However, the extent to which students in this school were instructed in English and/or Spanish varied considerably, with only 15 of the 29 fourth graders and 9 of the 20 fifth graders reporting that they currently received some instruction in Spanish. None of the students at the second school (13 fifth graders and 12 sixth graders) were in bilingual education classrooms, and none of them reported currently receiving instruction in Spanish.

Texts

Four expository passages that were understandable to an English-speaking student reading at the fourth-grade level were chosen and edited to provide short, self-contained English texts with a number of clear Spanish-English cognates. The texts ranged in length from 177 to 415 words. From these four texts, we selected a total of 34 target cognate words. These words had Spanish cognates and were judged by four researchers to be among the most difficult words in the text and important for students to understand the gist of the text. An additional 54 non-target cognates and 25 non-cognates were selected from the passages for inclusion in tests of passage vocabulary. (Appendix A contains one of the passages used, along with the accompanying questions.)

Experimental Measures

Students' prior knowledge of vocabulary from the passages was assessed in the two languages using two yes/no vocabulary tests, in which students were asked to report whether they knew the meaning of each word (Anderson & Freebody, 1981). Yes/no vocabulary tests have some limitations, the main limitation

being that students may differ in the threshold they adopt to determine whether they "know" a word. Students are likely to say that they know the meaning of a word even if they have only a limited or vague grasp of its meaning (Anderson & Freebody, 1981). Despite their limitations, however, yes/no vocabulary tests have been found to be a means of gaining useful information about children's vocabulary knowledge (White, Slater, & Graves, 1988).

Spanish vocabulary test. The Spanish vocabulary test contained the 34 Spanish cognates of the target cognate words from the passages. Also included were cognates of the 54 non-target cognates from the passages, and 25 words chosen as translations of selected non-cognates from the passages. In addition, the test contained 16 high-frequency Spanish words with low-frequency English cognates that did not occur in the experimental passages, and 98 Spanish-like nonwords. Words were listed in random order, and subjects read the list silently, indicating whether they knew individual words by circling *sí* or *no* next to the word on the test.

English vocabulary test. A parallel English yes/no vocabulary test was constructed, containing the 34 target cognates, 54 non-target cognates, and 25 non-cognates from the passages, 16 low-frequency English words not from the passages, and 98 English-like nonwords.

Target-word multiple-choice test. A multiple-choice test was constructed for the 34 target cognate words. (See Appendix B for a list of these words.) Each target cognate was given in a short phrasal context related to the use of the word in the reading passage from which it was chosen. A sample item for the word *abundant* is given in Table 1. (In the reading passage, the word occurred in the following context: "Naturally these ships had to be well-stocked with food. There usually was an abundant supply of dried vegetables, salted meat, dried fish, smoked ham, cheeses, and breads.")

[Insert Table 1 about here.]

These multiple-choice questions were thus "vocabulary-in-context" items; that is, rather than simply testing a student's knowledge of words in isolation, the items also required the student to use the word in context. Each item required the student to judge the equivalence in meaning between two phrases, rather than two words. Furthermore, the context of the word in the experimental passage also gave some clues for understanding its meaning. Therefore, these items represent subjects' use of vocabulary knowledge in reading comprehension rather than simply their vocabulary knowledge.

Cognate-circling task. Students were given a copy of the four experimental passages with written instructions that explained what cognates were and that asked them to circle all the cognates they found in the four passages. Instructions included examples of Spanish-English cognates. (See Appendix C for a copy of the instructions.)

Procedure

Subjects were tested in small groups during four sessions on four separate days. On the first day, the Spanish vocabulary test was given, along with a questionnaire to gather information about students' school and home experiences with English and Spanish. Two weeks later, the English vocabulary test was given. On the following day, students read the four passages, answering the target-word multiple-choice test for each passage immediately after reading that passage. On the following day, they completed the cognate-circling task.

RESULTS AND DISCUSSION

Yes/No Vocabulary Tests

Table 2 gives the mean proportion of words reported as known in the Spanish and English yes/no vocabulary tests for three categories of words: The 34 target cognates that were also tested in the multiple-choice test, the 54 non-target cognates, and 25 non-cognates. Repeated measures analysis of variance revealed that there was not a significant difference between English and Spanish in the number of words reported as known, $F(1,72) = 1.41, p > .2$. There was a significant difference among the three categories of words, $F(2,154) = 36.9, p < .001$, but no word Category x Language interaction ($F < 1$). These findings indicate that the students were in fact bilingual readers, and confirm our judgment that the target cognates were in fact the most difficult words in the text.

[Insert Table 2 about here.]

For the target cognates, we also looked at how the probability of knowing a word in English was related to whether it was known in Spanish. It was found that students knew a greater proportion (67%) of the English words for which they also knew the Spanish cognates than of English words for which they did not know the Spanish cognates (37%). That is, these students were much more likely to know a word in English if they knew its Spanish cognate.

Cognate-Circling Task

Three adult bilingual raters determined that in the experimental passages, 193 words were true cognates, 12 were false cognates, and 450 were non-cognates (multiple occurrences of the same word were counted only once). The total number of words circled in each of these categories was computed for each student. A word was counted as circled if the student had circled at least one occurrence of the word in the passage.

Students circled a mean of 41.7 true cognates (SD = 31.2); the range was from 0 cognates circled to 109. On the average, students circled 1 false cognate (SD = 1.3, range 0 - 6), and 19.6 non-cognates (SD = 26.9, range 0 - 126.). Of the words that students circled, 71% were true cognates (SD = 18, range 28 - 100). This last measure, proportion of words circled that were actually cognates, can be taken as a measure of students' knowledge of the construct *cognate*--that is, their explicit understanding of the relationships between the form and meaning of words in their two languages.

As the means indicate, students circled significantly more cognates than noncognates, $F(1,72) = 65.2$, $p < .001$, even though there were many more noncognate words available to circle. These results indicate that when given some simple instructions, bilingual, biliterate students are able to identify cognates and to distinguish true cognates from false cognates and non-cognates. However, the results also show that students do not recognize anywhere close to all the cognates in the passages. This, of course, may reflect lack of recognition of some cognate relationships, or lack of knowledge of the Spanish words, or both.

Multiple-Choice Test

Our primary interests in this study were to look at Hispanic bilingual students' handling of difficult vocabulary in English text, as reflected in the multiple-choice test, and to determine the extent to which their understanding of such vocabulary was dependent on their knowledge of Spanish cognates and their awareness of the cognate relationships between Spanish and English. Therefore, we performed a

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multiple regression analysis, using students' performance on individual multiple-choice items as the dependent variable. The analysis was performed on completely disaggregated data; that is, there were 34 observations per subject, one for each target word. Six independent variables and selected interactions among them were included in the analysis.

Three between-subjects variables were derived from students' performance on the English and Spanish vocabulary tests and the cognate-circling task. The first is English target vocabulary, that is, the proportion of target words reported as known on the English yes/no vocabulary test. The second is Spanish target vocabulary, that is, the proportion of target words reported as known on the Spanish yes/no vocabulary test. These two variables represent passage-specific vocabulary knowledge. However, given that they include 34 words from four passages on different topics, they also serve as reasonable approximations for general English and Spanish vocabulary knowledge, respectively.

A third between-subject variable is total target words circled, that is, the proportion of the target words the student identified as cognates in the cognate- circling task. This variable can be taken as reflecting the extent to which the student is aware of Spanish-English cognate relationships.

Correlations between these three between-subjects variables and students' overall scores on the multiple-choice test are given in Table 3. It is clear that English target vocabulary is the strongest predictor of performance on the multiple-choice test, which is hardly surprising because both variables reflect knowledge of the same 34 target words. The pattern of correlations also indicates that Spanish target vocabulary knowledge is not a very good predictor of performance on the multiple-choice test.

[Insert Table 3 about here.]

In this analysis, we are interested, not just in the effects of English or Spanish target vocabulary, but in finding out whether knowing a particular word in Spanish, or recognizing that particular word as a cognate, would have an influence on how the student understands that word in English text. This is the reason for taking each student's performance on each of the 34 target words as the unit of analysis. (This use of completely disaggregated data results in extremely and deceptively small amounts of variance accounted for; the magnitude of effects must be judged from the correlations in Table 3, and the means and standard deviations in Table 6.)

To examine students' performance on individual words, three within-subjects variables were derived from the vocabulary tests and the circling task: knowledge of the word in English (i.e., whether that individual word was reported as known by the subject on the English vocabulary test), knowledge of the word in Spanish (e.g., whether the cognate of that individual word was reported as known by the subject on the Spanish vocabulary test), and circling of the word (e.g., whether that individual word was identified as a cognate in the cognate-circling task).

A reduced regression model (excluding non-significant interactions) is given in Table 4.

[Insert Table 4 about here.]

Between-subjects variables. The significant main effect of English target vocabulary indicates that, as expected, students with larger English vocabularies did better on the multiple-choice test. This variable, as we have pointed out, serves reasonably well as a measure of proficiency in (written) English. Hence, by entering English target vocabulary first, we can examine what other variables contribute above and beyond any differences among subjects in their knowledge of written English.

The non-significant (but negative) effect of Spanish target vocabulary indicates that the students' overall Spanish proficiency did not contribute to multiple-choice test performance. The significant effect of total target words circled indicates that students who recognized more cognates in the passages did better on the multiple-choice test. That is, above and beyond any differences in proficiency in English or Spanish, students who showed more awareness of cognates were better at interpreting cognates in English text.

There was also a significant interaction between Spanish target vocabulary and total target words circled. To explore the nature of this interaction, we divided subjects into four quartiles on the basis of their performance on the cognate-circling task, from those who circled the least cognates to those who circled the most. For each quartile, Table 5 gives the mean performance on the multiple choice test, and the Spanish vocabulary test, and the correlation between the two.

[Insert Table 5 about here.]

As the means indicate, recognition of cognates is associated with both high multiple-choice test scores, and greater vocabulary knowledge in Spanish. However, the most dramatic differences among the quartiles appear in the correlations between Spanish vocabulary knowledge and English multiple-choice test performance. For the subjects as a group, there was almost no correlation between Spanish vocabulary and performance on the multiple-choice test, $r = .02$. However, this low correlation masks a more complex situation: For subjects who are adept at recognizing cognates, there is a strong positive correlation between Spanish vocabulary knowledge and English multiple-choice test performance. For subjects who recognize few cognate relationships, on the other hand, the relationship is negative.

Students' ability to recognize cognates depends on a number of factors. Presumably, students with larger vocabularies in English or Spanish are more likely to recognize words as cognates. However, once English target vocabulary and Spanish target vocabulary have been entered in the regression equation, the variable total target words circled can reasonably be taken to represent *awareness* of cognate relationships.

Within-subjects variables. The within-subjects variables give a picture that is largely similar. As would be expected, knowledge of the individual word in English was significantly related to multiple-choice test performance; subjects did better on those specific words they reported as knowing in English. However, knowledge of individual words in Spanish was also positively and significantly related to multiple-choice test performance. This stands in distinct contrast to the nonsignificant, negative effect of Spanish target vocabulary in the between-subjects analysis. Therefore, having a larger Spanish vocabulary (even passage-related vocabulary) was not necessarily a benefit to the student; but students who knew the Spanish cognates of specific English words did significantly better on the multiple-choice items for those words.

The interaction of circling with knowledge of the word in Spanish is parallel to the Spanish Vocabulary x Total Target Words Circled found in the between-subjects analysis. The exact nature of the interaction can be seen from the means shown in Table 6. Student recognition of a word as a cognate (as reflected by the circling task) was associated with better performance on the multiple-choice test only if the meaning of the word in Spanish was also known. In other words, it doesn't help to recognize that a new English word is the cognate of a Spanish word, if you don't know the meaning of the word in Spanish.

[Insert Table 6 about here.]

Instructional and Background Variables

Our results show that there is individual variation in students' ability to recognize English words as cognates of words known in Spanish. The correlations in Table 3 indicate that this ability is not strongly correlated with either English target vocabulary knowledge or Spanish target vocabulary knowledge. We therefore conducted exploratory analyses to see to what extent the ability to recognize cognates might be related to other background variables.

An exploratory multiple regression analysis was performed using number of target words circled in the cognate-circling task as the dependent variable. Independent variables were English target vocabulary, Spanish target vocabulary, school, grade, and interactions of these variables. Spanish target vocabulary and school accounted for a small but significant amount of the variance (about 7% each). None of the other variables, and no interactions, were significant. Not surprisingly, given our other findings, students who knew more Spanish target words identified more of the words in the English text as cognates. It is difficult to interpret the effect of school. The school in which students identified more cognates was also the school in which students were more proficient in English, and for which students reported less instruction in Spanish. Students in this school were also older; none of the fourth graders, and all of the sixth graders in the study were in this school. However, grade and English proficiency were not found to be related to the ability to identify cognates. Further exploratory analyses revealed that cognate circling was not significantly related to self-reported participation in bilingual education, schooling outside of the United States, or gender.

CONCLUSION

Results of this study indicate that most of the Hispanic bilingual, biliterate students we tested were aware of cognates and made some use of their knowledge of cognates in their English reading. The influence of reported Spanish word knowledge on the English multiple-choice test, when reported English word knowledge had already been taken into account, shows that students' knowledge of individual Spanish words is applied during English reading. Students' performance on the cognate-circling task further showed that most students were able to explicitly recognize cognates in text, and distinguish between cognates and noncognates, when given simple instructions.

Perhaps the most important finding is the interaction between Spanish vocabulary knowledge and awareness of cognate relationships. Knowledge of Spanish vocabulary can contribute to English reading comprehension, but this contribution is not automatic. Rather, the contribution of Spanish vocabulary to English reading depends on the extent to which the student is aware of the cognate relationships between the two languages.

Although our results show clearly that knowledge of cognates contributes to Hispanic bilingual students' reading in English, they also indicate that these students' knowledge and use of cognates is hardly at a ceiling. For example, in the cognate-circling task, students circled less than half of the cognates they had reported knowing in both Spanish and English on the yes/no vocabulary tests.

This study supports instruction aimed at increasing Spanish-English bilingual students' utilization of Spanish-English cognate knowledge in their English reading. The fact that students as young as fourth grade demonstrated cognate awareness suggests that explicit instruction in the use of cognates in students' second-language reading can help these students overcome difficulties that they may face with English reading vocabulary.

However, there are a number of interrelated factors that may affect bilingual students' knowledge and use of cognates in their reading and that may need to be taken into account in the development of appropriate instructional practices. Degree of bilingualism is one of these factors. All of the students in our study were bilingual and biliterate, although most of them were Spanish dominant in their vocabulary knowledge. The fact that difficult vocabulary in English often has more frequently known cognates in Spanish should make the transfer of Spanish lexical knowledge to English reading more advantageous than the transfer of English lexical knowledge to Spanish reading. Nonetheless, we suspect that bilingual, biliterate students should be able to use their cognate awareness to help them read unfamiliar vocabulary in either of their two languages. Qualitative findings based on think-alouds with smaller samples of expert bilingual readers suggest that this, in fact, does occur (see Jiménez, 1992; Jiménez, García, & Pearson, in preparation), although the extent to which such transfer is beneficial in both languages still needs further investigation.

A second factor that may influence students' recognition and use of cognates is the type of cognate relationship that exists between the cognates. For example, exploratory analyses of our data indicate that degree of orthographic similarity may play an important role in cognate recognition. The students' recognition of cognates seemed to depend on close overlap between the Spanish and English spellings. They were less likely to recognize cognates when a few letters were different. This appeared to be true even for words where there is some orthographic overlap and a systematic relationship between the English and Spanish suffixes. For example, few students recognized *reality* as a cognate of *realidad*, even though many English words ending in *-ity* have a corresponding Spanish cognate ending in *-idad*. This reliance on strict orthographic overlap may have been attributable to the instructions students were given for the cognate- circling task, which tended to emphasize orthographic overlap in the examples presented (see Appendix C).

On the other hand, recognition of such systematic cognate relationships requires some knowledge of the derivational morphology of both English and Spanish. Studies of monolingual morphological development indicate that although some knowledge of derivational morphology is acquired fairly early (Derwing & Baker, 1979), students' command of suffixes increases through high school and beyond (Tyler & Nagy, 1989), and is correlated with reading ability (Freyd & Baron, 1982). Hence, utilization of the help that cognates offer bilingual readers may depend in part on knowledge that is not yet fully developed in the upper elementary grades. The ability to differentiate true from false cognates and to deal with partial semantic overlap between the two languages, may also require a high level of cognitive flexibility and metacognitive awareness.

In conclusion, our findings indicate that Hispanic bilingual, biliterate students can transfer vocabulary knowledge gained in Spanish to their English reading, when they know the Spanish word and recognize the English word as a cognate. Further research is needed to determine the nature of these students' understanding of cognate relationships and the conditions under which instruction on cognates can enhance their English reading comprehension.

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Table 1

Example Multiple-Choice Item

An abundant supply of food means that:

a. there was awful food

b. there was very little food

c. there was good-tasting food

d. there was lots of food

Table 2

Mean Proportion of Words Reported Known in Yes/No Vocabulary Tests

	Reported known in English	Reported known in Spanish
Target Cognates	.58 (.49)	.65 (.48)
Non-Target Cognates	.77 (.42)	.79 (.41)
Non-Cognates	.63 (.48)	.71 (.45)

Note: Standard deviations are in parentheses.

Table 3

Correlations Among Measures of Multiple-Choice Test Performance, English and Spanish Vocabulary, and Circling of Target Cognates

	Multiple-Choice Test Score	English Vocabulary	Spanish Vocabulary	Total Target Words Circled
Multiple-choice test score	---	.49**	.12	.30**
English vocabulary	.51	---	.26*	.12
Spanish vocabulary	.12	.26*	---	.25*
Total target words circled	.30**	.12	.25*	---

*$p < .05$

**$p < .01$

Table 4

Multiple Regression Analysis of Relationship Between Multiple-Choice Performance and Student Circling of Words and Self-Reported Word Knowledge

	R^2 Change	Regression Coefficients[a]	F to Enter
Between-Subjects Variables			
English target vocabulary	.036	.38	24.3**
Spanish target vocabulary	.001	-.66	0.2
Total target words circled	.013	-.83	11.3**
Spanish target vocabulary x Total target words circled	.007	1.82	9.8**
Constant		.58	
Within-Subjects Variables			
Knowledge of word in English	.018	.10	48.8**
Knowledge of word in Spanish	.010	.08	26.4**
Circling of word	.002	-.05	4.0*
Circling of word x knowledge of word in Spanish	.003	.13	7.7**
Constant		-.04	

* $p < .05$ ** $p < .01$

[a] Regression coefficients for between-subjects variables are from an analysis including only these variables; regression coefficients for within-subjects variables are from the full analysis.

Table 5

Relationship of Performance on Cognate-Circling Task to Multiple-Choice Test Performance, Spanish Vocabulary, and the Correlation Between These Two

	Quartiles According to Number of Target Cognates Circled			
	1	2	3	4
Multiple-Choice Proportion Correct	.41 (.20)	.49 (.16)	.49 (.18)	.58 (.18)
Spanish Target Vocabulary Proportion Reported Known	.59 (.22)	.64 (.20)	.66 (.16)	.72 (.18)
Correlation Between Multiple-Choice and Spanish Target Vocabulary	-.60	.03	.15	.52

Note: Standard deviations are in parentheses.

Table 6

Proportion of Words Answered Correctly on Multiple-Choice Test, Categorized by Reported Knowledge of words in Spanish and Identification of Word as Cognate in the Circling Task

		Identification as Cognate in Circling Task	
		Circled as Cognate	Not Circled as Cognate
Reported knowledge of word in Spanish	Known	.62 (.49)	.47 (.50)
	Not Known	.34 (.48)	.39 (.49)

Note: Standard deviations are in parentheses.

APPENDIX A

Sample Passage with Accompanying Questions

Venus

Venus is the most brilliant of all planets. In its size, mass, and distance from the sun, it is the planet most similar to the Earth. For these reasons it has been called Earth's "sister planet."

Much of what we know about Venus was discovered in recent years by spaceships sent there by Russia and the U.S. One of the hardest working spaceships ever sent into space is Pioneer Venus Orbiter. It has been orbiting Venus since 1978, sending back thousands of photographs and measurements obtained by its scientific instruments.

When we look at Venus through a telescope, we never see its solid surface because it is always hidden by a thick cover of clouds. In the photographs we see cloud layers and formations shaped by wind patterns. These clouds are a special part of the planet's atmosphere.

It's surprising to think that Venus has about a hundred times as much air as Earth, even though you could not breathe the air on Venus. The gases in Venus' clouds are very different from those on the Earth. Venus' air contains mostly carbon dioxide, but no oxygen.

Venus has a different climate from the Earth. We are accustomed to seeing clouds part of the time. Venus has them all of the time. Our clouds are made of water vapor while Venus' clouds are made of sulfuric acid. Since clouds reflect sunlight, Venus appears brighter than the Earth.

Venus' atmosphere acts like a big blanket that warms the planet. The little bit of sunlight that gets through the clouds warms the surface. As the surface gets warm, it gives off heat. The gases of the atmosphere absorb this heat, keeping the surface hot and the atmosphere warm.

On Earth, our atmosphere works in the same manner. But our air is less dense and has only a little carbon dioxide to absorb the heat. If Venus had an air blanket like ours, its surface would be only a little warmer than ours. Instead, its actual surface temperature is about 900 degrees Fahrenheit, which is greater than the highest temperature of a kitchen oven. You can see why there are no oceans on Venus; any water there would have boiled away long ago. Venus is hotter and dryer than any place on Earth.

1. The spaceship is *orbiting* Venus means that:

   a. the spaceship is going to Venus
   b. the spaceship is leaving Venus
   c. the spaceship is circling Venus
   d. the spaceship is landing on Venus

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2. Scientific *instruments* are:

   a. tools scientists use to measure things
   b. problems that scientists want to solve
   c. places where scientists do their work
   d. facts that scientists have learned

3. To be *accustomed* to something means:

   a. to hate it
   b. to be used to it
   c. to be afraid of it
   d. to wear it

4. A planet's *atmosphere* is:

   a. the path it follows around the sun
   b. the type of rocks on its surface
   c. the number of its moons
   d. the gases around it

5. To say that Venus is the most *brilliant* of all planets means that it is:

   a. the largest planet
   b. the closest planet to Earth
   c. the brightest planet
   d. the darkest planet

6. Something is *solid* if:

   a. you can put your hand through it
   b. you can't put your hand through it
   c. you can drink it
   d. you can't see it

7. A *telescope* is a tool for:

   a. seeing things that are very far away
   b. sending messages to Earth
   c. measuring the speed of the spaceship
   d. looking at very small animals

8. The *climate* of a planet is:

   a. the temperature of the center of the planet
   b. the color of the planet's sky
   c. the weather on the planet
   d. the distance around the planet

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9. Why do scientists send spaceships to Venus?

   a. to carry water there
   b. to take medicine and clothes to the astronauts there
   c. to collect valuable gases
   d. to take pictures and measurements

10. Venus is:

   a. covered with oceans
   b. hot and dry
   c. cold and dark
   d. covered with ice

APPENDIX B

Target Cognates

Passage 1

transport	transportar
adapted	adaptar
domesticated	domesticar
species	especies
excessive	excesivo
tolerate	tolerar
temperamental	temperamental
transform	transformar

Passage 2

intestinal	intestinal	
diet	dieta	
confirms		confirmar
logical	lógico	
naturally		naturalmente
abundant		abundante
contracted		contratar
mysterious		misterioso
grave		grave
deficiency		deficiencia
disembarked		desembarcar
beneficial		beneficioso

Passage 3

orbiting		orbitar
instruments		instrumentos
accustomed		acostumbrado
atmosphere		atmósfera
brilliant	brillante	
solid	sólido	
telescope		telescopio
climate		clima

Appendix B (Continued)

Passage 4

novels	novelas
navigated	navegar
curious	curioso
author	autor
imagination	imaginación
explore	explorar

APPENDIX C

Instructions for Cognate-Circling Task

Some words in English are spelled the same, or almost the same, as words in Spanish, and have almost the same meaning.

For example:

importance in English and **importancia** in Spanish

illustration in English and **ilustración** in Spanish

decide in English and **decidir** in Spanish

Such pairs of words are called cognates. Recognizing cognates may help you figure out some of the hard words you come across when you read in English.

In this test, you will see copies of the passages you have just read. This time, go through these passages and circle all the words that are similar to Spanish words in both spelling and meaning.

Here's an example:

During the past few years people have been investigating some animals that live in the oceans. These animals are dolphins. They are small members of the whale family.

In this passage, several words are similar to Spanish words. You could have circled the following:

investigating because it's like the Spanish word **investigando**
animals because it's like the Spanish word **animales**
oceans because it's like the Spanish word **océanos**
dolphins because it's like the Spanish word **delfines**
members because it's like the Spanish word **miembros**
family because it's like the Spanish word **familia**

If you have any questions while you are taking the test, please raise your hand.

Near the end of the time limit, I will tell you how much time remains. When you are finished with the test, please turn it over and wait quietly.